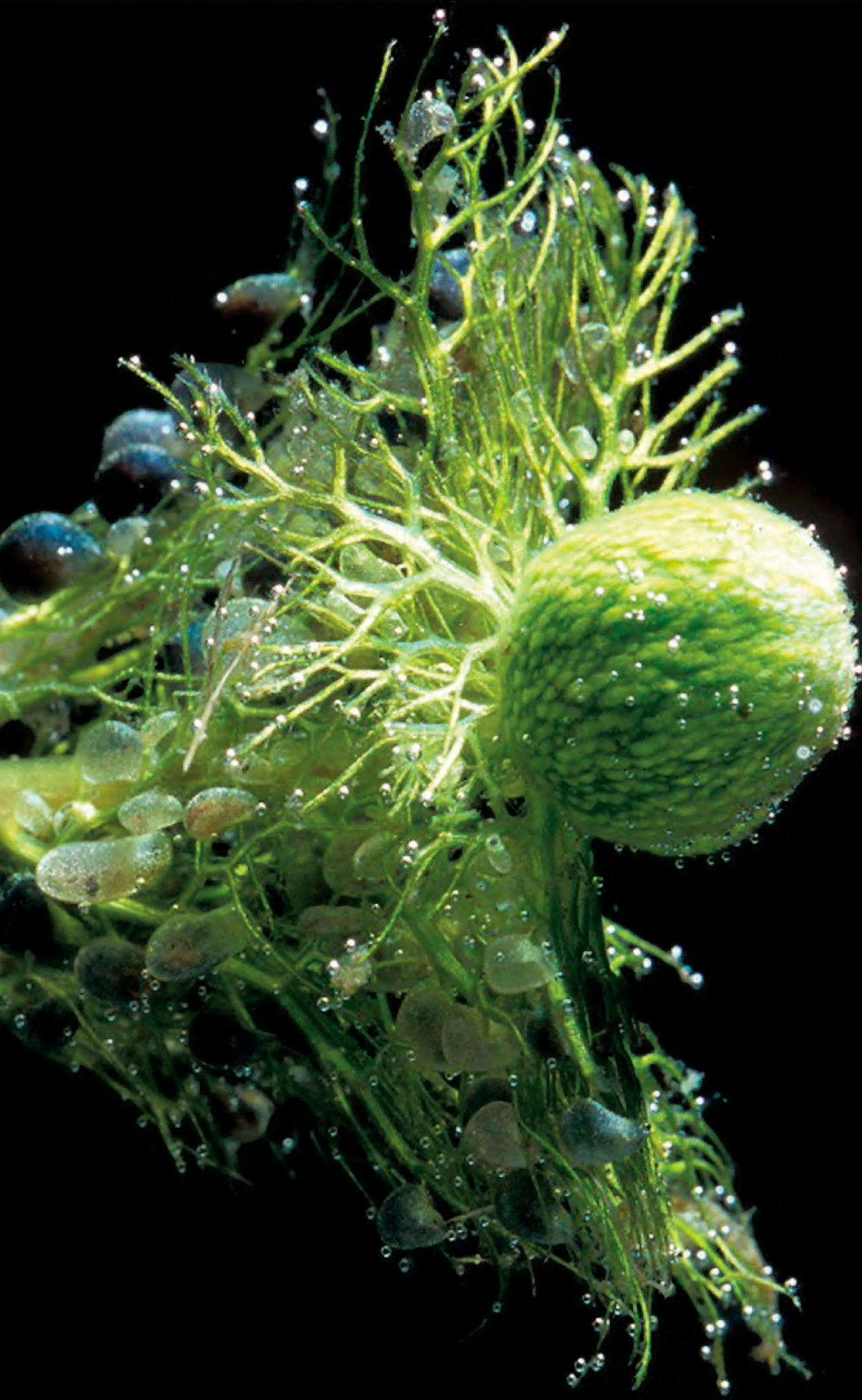


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Front Cover: *Utricularia macrorhiza*, late season turions, preparing for winter dormancy at a high elevation site (Plumas County, California, USA). Photo by Barry Rice. Article on page 128.

Back Cover: *Utricularia macrorhiza*, late season turions at a circumneutral pH bog (Berkshire County, Massachusetts, USA). Photo by Barry Rice. Article on page 128.

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CONTENTS

Obituary Emeritus Prof. Dr. Stephen E. Williams -----124

Anatomic adaptation of stems of aquatic *Utricularia* species dragging turions to the
bottom of their habitats -----128

Utricularia australis R. Br. (Lentibulariaceae): an addition to the carnivorous plants in
flora of Gujarat, India -----139

Utricularia purpurea (Purple Bladderwort) occasionally weedy in northern Wisconsin -----144

New cultivars -----149

Cultivar names registered in 2022 and 2023 -----154

ADDITIONS TO THE ICPS ACHIEVEMENT AWARDS WEBPAGE

The ICPS Achievement Awards webpage, <https://www.carnivorousplants.org/about/Awards>, is more than a list of awards given by the ICPS to individuals for contributions related to carnivorous plants. Yes, there are links to pages or PDFs for ICPS Lifetime Achievement Awards and remembrances published in CPN. But thanks to Richard Nunn, there is a new section with short biographies of historic figures who made contributions to the study and taxonomy of carnivorous plants.

The “Key historical figures in the study of carnivorous plants” section is a dangerous rabbit hole, or wombat hole in Australia, if you only have a few minutes. If you wonder who *Drosera hookeri* is named after, you will find the father and son: William Jackson Hooker and Joseph Dalton Hooker. In this case we want the son and Charles Darwin’s bud Joseph Dalton Hooker. But of course, you must read about the father as well. On J. D. Hooker’s page, you will notice he named *Nepenthes northiana* and *N. lowii*. The next stop is Marianne North. Of course, you want to read more about her and see more of her paintings on Wikipedia. The page on Hugh Low is a must as well. Then on the main page you notice Augustin François César Prouvençal de Saint-Hilaire. That sounds familiar. In researching South American *Drosera* you found he named *Drosera graminifolia* St.Hil., *Drosera communis* St.Hil., and *Drosera hirtella* St.Hil., among others. On the webpage you find out “He was able to gather 24,000 specimens of plants (comprising 6000 species), as well as 2000 birds, 16,000 insects and 135 mammals, plus many reptiles, molluscs and fish” in Brazil. I doubt very much he did all that himself.

—JOHN BRITTNACHER • john@carnivorouplants.org

OBITUARY EMERITUS PROF. DR. STEPHEN E. WILLIAMS

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It was with great sadness that we learned of the death of our esteemed colleague and good friend Emeritus Prof. Dr. Stephen E. Williams. He passed away on 3 April 2024 at the age of 81. We extend our deepest sympathy to his entire family. His loss also leaves a gap in science that is difficult to fill. His pioneering experiments in the research of the sundew family, in particular the world-famous Venus flytrap, have enriched biology since the 1970s with numerous, much-cited publications. With his excellent skills of observation and keen intellect, he was always able to add surprising details to the scientific knowledge about the “most wonderful plant in the world” according to Charles Darwin.

I well remember the ICPS World Conference in Tokyo, where my wife Irmgard and I first met Steve in 2002. Unusual structures of a newly described sundew had aroused his interest and he wanted to study them more closely. He approached me during a lecture break to enquire about plant samples from our greenhouse in Germany. Steve offered to examine them with a scanning electron microscope at Lebanon Valley College (Pennsylvania, USA), where he taught biology as a professor. Irmgard and I were delighted and once in conversation we quickly discovered a strong mutual interest in rapid capture motions in the sundew family. At the turn of the century, it was still rare to find such a competent discussion partner on functional morphology.

I was amazed by his detailed knowledge of the role of electrical action potentials, which trigger movement in plants in a comparable way to nerves in animals. In pioneering scientific work, Steve had experimentally examined their function in sundews and the Venus flytrap. As early as 1972, he published the paper “Receptor Potentials and Action Potentials in *Drosera* Tentacles” in *Planta* with his colleague and good friend Barbara Pickard. In 1982, he attracted great attention when the renowned *Science* magazine published his research on the closure of the Venus flytrap, conducted with Alan Bennett, in the paper “Leaf Closure in the Venus Flytrap. An Acid Growth Response”. *Science* even dedicated the front page to him. The list of his publications is too long to mention here. However, I will go into more detail about Steve’s last projects, which were very close to his heart and in which Irmgard and I had the pleasure and honor of being involved.



Stephen Williams with daughter Emily.
Photo by Emily Tilley.

In 2002 in Tokyo, Steve, obviously also very pleased, enquired about our experiments with fast catapult mechanisms in sundews. He told us that he had already written to the Australian naturalist Rica Erickson in the 1970s to ask her about rapid tentacle movements in the Australian hotspot of the genus. To no avail, the author of the book “Plants of Prey” (1968) about Australian carnivorous plants was unable to provide any information. Steve knew that the snap traps of *Aldrovanda* and *Dionaea* had evolved from sticky traps. He was convinced that, because of the close relationship, there could be a fast mechanism somewhere in the sundews, which are usually described as quite slow. Now video recordings from our greenhouse showed him exactly such a fast trapping mechanism, as he had long postulated, in an Australian *Drosera*. Even faster than in *Dionaea*. Steve’s hypothesis could thus be scientifically confirmed after three decades. Since this discussion at the Tokyo National Museum of Nature and Science, which was so gratifying for both of us, we have remained in friendly contact.

Even after his retirement in 2014, Steve’s focus was on the “most wonderful plant in the world”. For many colleagues, *Dionaea* was already considered well researched, but Steve still found details that triggered his scientific curiosity. In 2016, he asked by email if we could observe ants in *Dionaea* traps. He couldn’t get the book “The Most Wonderful Plant in the World” by Frank Morton Jones (1923) out of his head. The behavior of ants in open snap traps described there aroused his suspicion of an as yet unrecognized phenomenon. This suspicion turned out to be true, but unfortunately for the moment our ants refused to cooperate. Steve also wondered why the famous wildlife filmmaker David Attenborough was able to show a cultivated *Dionaea* with thick drops of nectar being sipped by a fly on the BBC in 1993. During his extensive field tests in 1977 at the Green Swamp, North Carolina, together with Thomas Lichtner, the traps of 152 plants examined and documented with photos were dry, i.e. without visible nectar production. Moreover, flies as prey were major exceptions there. Whenever such contradictions aroused Steve’s researcher’s curiosity, he never stopped trying to resolve them in a scientifically correct way through research and sophisticated experiments.

So, we scoured the literature and the internet together. Steve had invited me to join his “Private University Consortium” on the ResearchGate science platform years earlier, which made it easier to read relevant papers that Steve, as a passionate teacher, regularly recommended as homework. In addition, Irmgard and I filmed and documented in the greenhouse and garden what and how much of it our numerous Venus flytraps captured. Steve needed the data to compare prey capture in culture with his field studies at the natural site in North Carolina. The results of this close and harmonious collaboration were impressive and we were very pleased when our joint paper “Prey Capture by *Dionaea muscipula*. A Review of Scientific Literature with Supplementary Original Research” was published.

In the meantime, Steve experimented with different wildlife cameras and various lenses for close-ups. He sent me the footage for editing or to create comparative collages for planned technical articles. With his brother, Richard Williams, he developed a stable mount that made it possible to film the ground beneath the cameras. For what purpose? Of course, for long-term recordings of wild growing *Dionaea*. His plan was to document an entire annual cycle in this way. This had to be well prepared.

In the spring of 2019, it came as a complete surprise when little ants decided to build their nest in our garden right next to a group of Venus flytraps. They kept running through numerous snap traps ... without triggering them. But why? Steve had wanted just such a set three years earlier for new experiments. When I emailed him photos and suggestions for a series of experiments that could be

carried out immediately, he was delighted. Could we finally solve Frank Morton Jones' "ant puzzle" by this coincidence?

We photographed, filmed and documented the prey of all the plants for a month, with Steve carefully checking that everything was scientifically correct. We counted on a precise schedule how many ants passed through the traps without triggering them. There were many, an average of 520 passages per day. That was enough for a decent statistic. Each day we analyzed the new data and were delighted to see how the ants solved Jones' puzzle more and more clearly. The plant revealed a strategy to save energy by allowing unprofitable small ants to pass unharmed along a scent trail at the upper edge of the trap. Plenty of material for our joint paper "*Dionaea* Traps Selectively Allow Small Animals to Escape" for the December 2019 issue of CPN as well as a film documentary of the same name. A comparison showed how amazingly effective the mechanism found is: only 0.04% of the passing ants were caught. The risk of a hospital patient dying from a treatment error in Germany is 0.1%, which is 2.5 times higher. Steve was really pleased to see that Jones' "ant puzzle" could be solved so clearly.

Then Steve's last big project made progress. In 2019, he contacted Bill Scholl in Florida, who owns a plot of land with wild growing *Dionaea*. Steve and Bill knew each other from some CP-events and he was planning to install three time-lapse cameras there with his brother Richard and his daughter-in-law. Unfortunately, Covid intervened. The planned trip was canceled. So, Steve sent a first camera with the special mounts by post. Bill Scholl managed to get such remarkable shots that he ended up with three cameras, which he monitored regularly. One camera ran continuously from May 2020 to January 2024.

Steve regularly sent me the footage via OneDrive for editing. This project was very close to his heart. He followed the editing of the raw material with excitement. Once again, it was a very harmonious collaboration and we were both really happy when the single shots taken during rain and storms, including a hurricane and controlled fires, gradually developed into an almost smooth, informative time-lapse during editing.

Then the bad news began. Since March 2023, the project has been on hold for a while due to hospitalization and a cure. Thankfully, Steve's daughter Emily kept in touch with us when her father was temporarily unable to do so. I was finally able to show Steve the finished timelapse film in May 2023 and he delightedly gave the green light to upload it to YouTube under the title "Monitoring Venus Flytraps. Amazing 1-Year Timelapse." It was to be Steve's last big project. In one of his last emails, Steve wrote: "Siggi, ... I am still alive but not doing so well these days. I wish I had more time for Carnivorous plants." And typical of Steve: "I think that the article linked at the end of the message below will interest you."

In April 2024, an email arrived from his daughter Emily with the sad news of his passing. Dear Steve, we all miss you so much. Rest in Peace.

I would like to take this opportunity to pass on to Steve's family and friends the spontaneous condolences received from a number of scientific colleagues who knew him and appreciated his expertise. Dr. Jan Schlauer (University of Tübingen) mentioned: "Very sad news, indeed. Stephen was one of the first investigators to describe the closing movement of the Venus flytrap as an acid growth process at a time when it was widely considered a "simple" turgor loss response like in the pulvini of Mimosa."

Dr. Simon Poppinga (Scientific director of the Botanical Garden of the TU Darmstadt) wrote: "Even though I was unfortunately never able to meet Stephen in person, we were still "digitally closely connected" over the last few years. I fondly remember his many, sometimes very long and

detailed emails in which he reported on largely unknown peculiarities of Venus flytraps and sundews. For example, he put their trap leaves into the so-called Scholander bomb to determine their water potentials. He also determined the stiffness of the epidermises of the Venus flytrap trap leaf qualitatively and by hand, by treating them in the open and closed states with a punch roller. I was fascinated by his profound comments and recommendations of current literature. He was always an astute reader and critic, and answering his questions about my own publications satisfactorily was always both a pleasure and an excitement for me. It is a pity that Stephen is no longer with us.”

And Dr. Andreas Fleischmann (Curator of vascular plants Botanische Staatssammlung Munich), whose words I would like to quote in conclusion: “I will always remember having met Stephen Williams at the ICPS Conference 2006 in Frostburg, where I enjoyed chatting with him about carnivorous plants. The pioneer in carnivorous plant action potential research was a very kind, helpful and cheerful colleague - I will miss the scientific carnivorous plant correspondence I had with him in the past years. Rest in peace, Stephen.”

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ANATOMIC ADAPTATION OF STEMS OF AQUATIC *UTRICULARIA* SPECIES DRAGGING TURIONS TO THE BOTTOM OF THEIR HABITATS

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Keywords: Aquatic carnivorous plant, Lentibulariaceae, winter buds, turion development, turion floating, central cylinder, stem decomposition, phenol impregnation

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Abstract: Turions are vegetative, dormant, overwintering storage organs formed in aquatic plants. We have observed that shoots with maturing turions of three robust aquatic *Utricularia* species possess an anatomical adaptation of the central cylinder in apical shoot segments. The senescent mother shoots drag turions in these species to the bottom of their habitat. This adaptation leads to impregnation of the central cylinder by substances preventing the stems from early decomposing. Using anatomical staining methods, we have aimed to elucidate the substances impregnating the central cylinder – partly lignin and mainly polyphenols.

Introduction

Turions (winter buds) are vegetative, dormant storage organs produced by perennial aquatic plants in response to unfavorable ecological conditions in subtropical to polar zones, usually at the beginning of autumn. They form at least in 14 genera of vascular aquatic plants, especially in submerged (or amphibious) and free-floating species (Sculthorpe 1967; Adamec 1999, 2018). They also form in temperate species or populations of both rootless aquatic carnivorous genera, monotypic *Aldrovanda vesiculosa* (Droseraceae), and in many *Utricularia* species (Lentibulariaceae, Adamec 2018, 2020). Their purpose is to avoid fragile summer shoots being embedded in ice. Turions are formed by extreme shortening of apical shoot internodes with modified shortened leaves or scales (Figs. 1, 2, front and back covers). Turions of most aquatic plants, including those of carnivorous taxa, usually overwinter at the bottom of aquatic sites in darkness and under hypoxic or anoxic conditions, but they can also overwinter at the water surface or on a wet substrate, and the turions of these species exhibit frost resistance (Sculthorpe 1967; Adamec & Kučerová 2013; Adamec 2018). In contrast with bottom-rooted species, turions of submerged rootless carnivorous species form, mature, germinate, and sprout in light and warmer water at the water surface. However, two distinct ecophysiological strategies of autumnal turion sinking

and spring rising (floating up, buoyancy) have been identified in carnivorous plants (Adamec 2008, 2018).



Figure 1: Mature turions of *Utricularia australis* formed in outdoor culture and stored in the fridge; January 2024. Distance between ticks indicate 1 mm.



Figure 2: Mature turions of *Utricularia macrorhiza* formed in outdoor culture; late November 2018.

In *Aldrovanda* (and also in non-carnivorous *Hydrocharis morsus-ranae*), an active mechanism of autumnal turion sinking and spring rising has developed. Within this group, mature autumnal turions usually break from the dying mother shoots in a dehiscence zone and sink gradually to the bottom as the voluminous air spaces in turion leaflets are filled with water. In the spring in warmer water during the break of the imposed dormancy, the water in the air spaces is expelled by a CO₂-enriched gas evolving from increased respiration, and the turions rise again (Adamec 2003, 2008, 2018). Turions of several robust *Utricularia* species (*U. vulgaris*, *U. australis*, *U. macrorhiza*, *U. tenuicaulis*) are usually less dense than water, and in the autumn these buds, which are firmly connected to the mother shoots, are dragged to the bottom. By early spring, the turions usually separate and rise to the surface, though small turions can separate as early as in autumn and then float at the surface over winter (Adamec 2018). Turions of several smaller species usually growing in very shallow water (*U. minor*, *U. bremii*, *U. intermedia*, *U. ochroleuca*, *U. stygia*) may develop the dehiscence zone and separate in autumn or may be attached to senescent shoots for several weeks.

The observation that in some robust *Utricularia* species, autumnal stems adjacent to maturing turions form a specific anatomic adaptation to drag the mature turion to the bottom (Fig. 3), motivated this study. This paper aims to describe the anatomic stem adaptation preceding turion maturation in three robust aquatic *Utricularia* species with monomorphic shoots (*U. vulgaris*, *U. australis*, and *U. macrorhiza*), in contrast with a species with dimorphic shoots (*U. stygia*) forming the turion dehiscence zone.

Materials and methods

Plants of *Utricularia vulgaris* L. (from S. Moravia, Czech Rep.), *U. australis* R.Br. (from S. Bohemia, Czech Rep.), *U. macrorhiza* Le Conte (from Canada) and *U. stygia* Thor (from S. Bohemia) were grown outdoors in 85- to 1500-L plastic containers mimicking natural dystrophic (humic) waters and *Carex* litter or brown peat were used as the main substrate (see Adamec *et al.* 2020, 2024). It has been repeatedly observed in the last years that stem segments just below maturing large turions in robust *Utricularia* species (*U. vulgaris*, *U. australis*, *U. macrorhiza*) are mechanically firm and rigid and that the central cylinder of these apical stem segments is markedly colored brown (Fig. 3). On 14 October 2022, a subapical stem internode ca. 5 mm long, between the first and second leaf node ca. 0.5–1 cm below the maturing turion, was cut off from several robust and long shoots of *U. vulgaris*, *U. australis*, and *U. macrorhiza* for anatomical investigations. Simultaneously, for comparison with the summer growing stem anatomy, a 5-mm long stem segment 50 cm below the turion in *U. vulgaris* (or 40 cm in *U. australis* and *U. macrorhiza*), was cut off from each plant. These stem segments were formed at the peak of the growing season (July to mid-August) and represent typical summer stem anatomy. Similarly, on 26 October 2022, subapical (3–6 mm below turion) and basal (10 cm below turion) stem segments were sampled from photosynthetic shoots of *U. stygia* as the comparison with a species forming dehiscing turions. All sampled stem segments were first fixed in 70% ethanol until anatomic processing.

Detection of lignin (polyphenols)

The apical and basal stem segments were placed in 96% ethanol for a limited time, then properly washed in phosphate-buffered saline and post-fixed overnight at 4°C in Bouin-Hollande solution without acetic acid but supplemented with mercuric chloride (Levine *et al.* 1995). Standard

procedures were used for tissue dehydration, embedding in paraplast, sectioning to 7–10 μm , de-paraffinization, and rehydration in 70% ethanol. Lignin was stained with Safranin O/Astra Blue dyes combination (Diapath, Martinengo BG, Italy) for 10 min according to the manufacturer's protocol. The stained sections were washed in distilled water, dehydrated and embedded in DPX medium (Fluka, Buchs, Switzerland) and viewed and imaged under the Olympus BX51 microscope equipped with an Olympus DP80 CCD camera (Olympus Corporation, Tokyo, Japan).

Detection of phenols

The apical and basal stem segments were placed in 96% ethanol for a limited time, then hand cut into thin cross sections, which were then washed in sodium borate buffer pH 8.5 and stained with 0.1% toluidine blue (Sigma-Aldrich, Inc., St. Louis, Missouri, USA) in acidic sodium borate buffer pH 4.0 for 5 min. Sections were briefly rinsed in acidic borate buffer and then in distilled water. The samples were mounted in 100% glycerol, and blue-green staining of toluidine blue, or the autofluorescence emission in the green spectra, was imaged under the microscope BX63 (Olympus, Japan) equipped with the DP74 CMOS camera (Olympus, Japan).

Results and discussion

As seen in the photos of the anatomical adaptation of apical segments in *U. vulgaris* stems, the central cylinder, both in maturing turions (Fig. 3A) and in mature ones (13 Nov 2022, Fig. 3B), is brown and, unlike the decomposing cortex, it remains intact and is not subject to rapid decomposition. In this way, it helps keep the mature turions on the bottom until spring. Otherwise, the anatomy of apical and basal stem segments of *U. vulgaris*, *U. australis*, and *U. macrorhiza* is very similar. However, the basal stem segments grew in the summer, whereas the apical ones grew simultaneously with early turion maturation in September (Adamec *et al.* 2024). The stem of these species is round-shaped and has a diameter of ca. 1.5–1.8 mm (Figs. 4–6). The parenchymatic cortex with regular, radially arranged large air spaces is separated by an endodermis with weakly developed Casparian strips from the central cylinder (cf. Schweingruber *et al.* 2020). The xylem and phloem within the central cylinder are difficult to distinguish. In apical and basal stem segments, the proportion of the diameter of the central cylinder to the total stem diameter is the same, around 25–35%. The central cylinder in both parts of the stems consists mainly of thick-walled cells. These cells are locally and variably stained red by Safranin (Figs. 4–6) and the whole cylinders are stained blue by toluidine blue (Figs. 4–6) in both parts of the stems. Still, the staining in apical segments by both stains is usually somewhat stronger. In line with this, the blue-light-excited fluorescence of stems stained by toluidine blue (*sensu* Hutzler *et al.* 1998; Sulborska *et al.* 2020) led to marked green coloration (Figs. 4–6), which was stronger in apical segments. In apical *U. vulgaris* stem segments, staining by acidic phloroglucinol for lignin detection resulted in weak staining, and staining by lipidic Sudan Red 7B for suberin (cork) gave negative results (A. Soukup, unpubl. results). Apical and basal stem segments of *U. stygia* were only around 1 mm in diameter and their central cylinder was relatively very thin (only around 17–18% of the total stem diameter). Staining by Safranin or toluidine blue was very weak in both segments of the stem (Fig. 7).

As it follows from the microphotos, the anatomy of apical stem segments bordering with turions in *U. vulgaris*, *U. australis*, and *U. macrorhiza* with robust shoots is not too different from that in basal segments. The results may be interpreted (e.g. after Bond *et al.* 2008; Baldacci-Cresp 2020;

Schweingruber *et al.* 2020) that—at least in *U. australis* and *U. macrorhiza*—apical stem segments are more lignified in their central cylinder than in basal ones. Still, the level of lignification is not high. Moreover, except for *U. australis*, the central cylinder, as well as the adjacent inner layers of the cortical cells in the apical segments in the other two robust *Utricularia* species (especially in *U. vulgaris*), contain more phenolic compounds than the basal ones (e.g. after Hutzler *et al.* 1998;

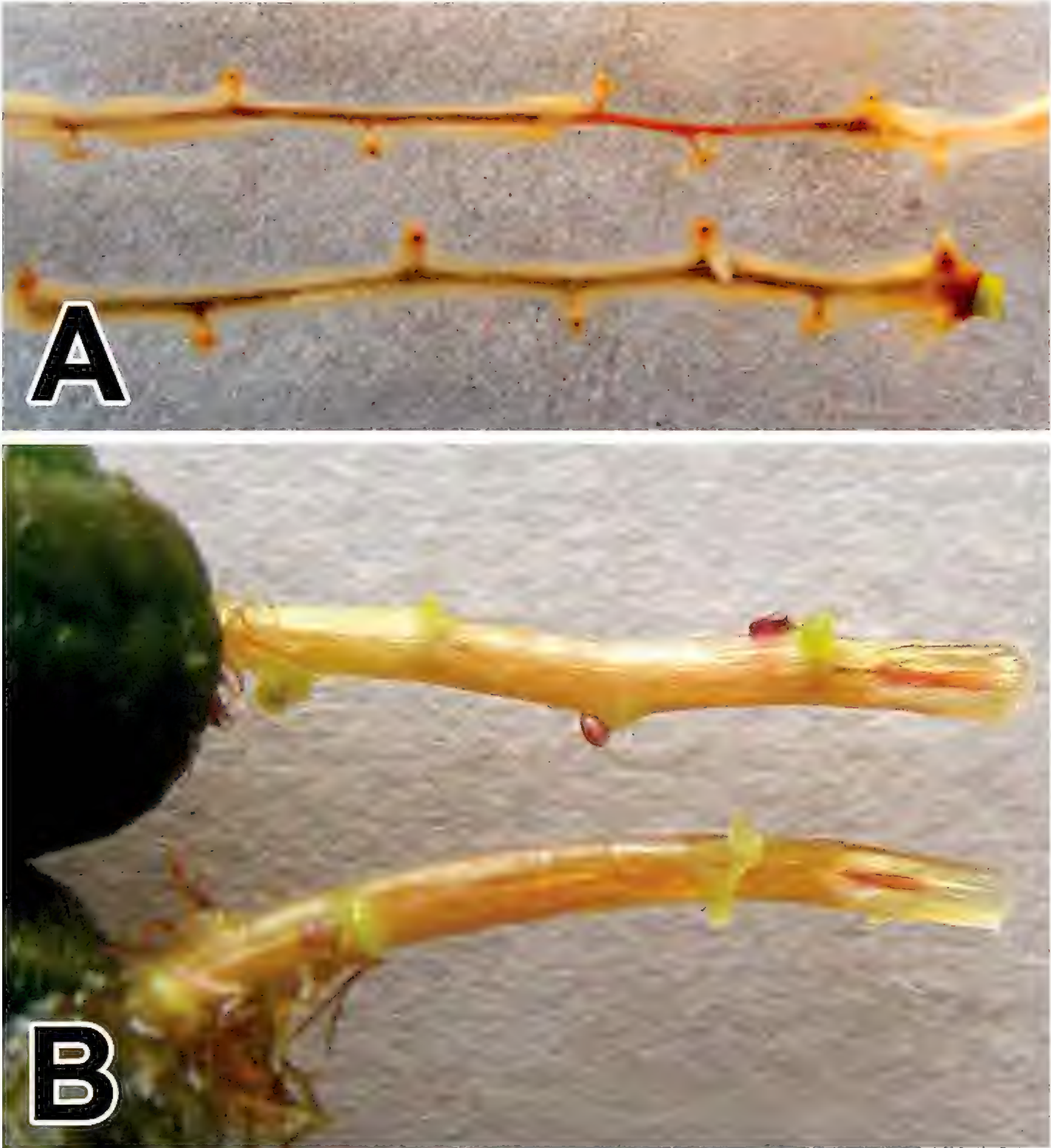


Figure 3: (A) Decomposing apical segments of stems of *Utricularia vulgaris*, which were attached to mature turions and which had dragged the turions to the bottom of an outdoor container; 13 November 2022. Note that the stem cortex is rather decomposed, but the brown central cylinder is quite intact. (B) Mature turions with adjacent stems and brown central cylinder in odd stem sections, 14 October 2022.

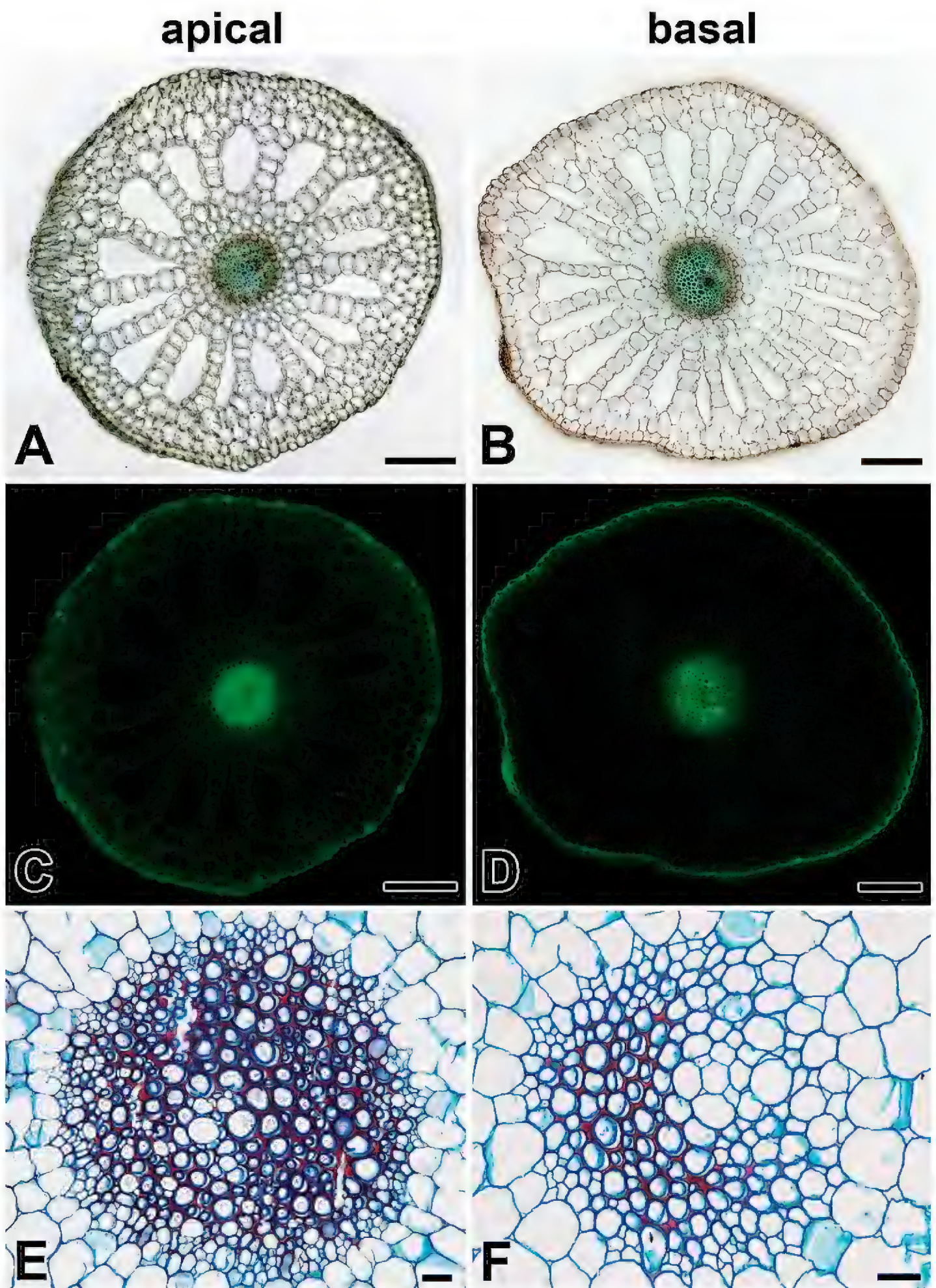


Figure 4: Cross-sections through apical (A, C, E) and basal (B, D, F) stem segments of *Utricularia australis*. (A-B) stained by toluidine blue for phenolic substances; (C-D) a fluorescence induced by blue light; (E-F) details of central cylinder stained by Safranin/ Astra Blue for lignin. Scale bar: (A-D) 200 μm ; (E-F) 20 μm .

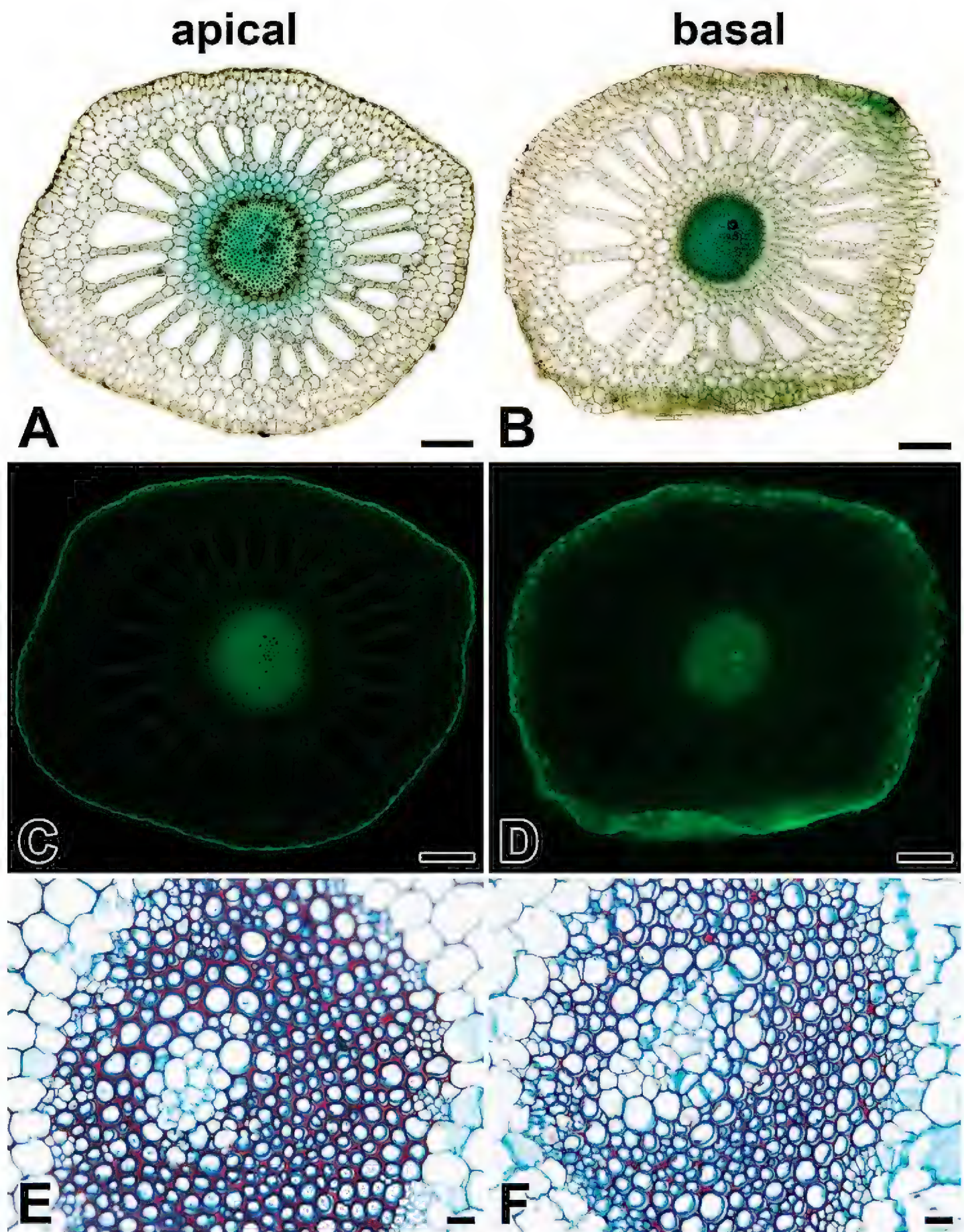


Figure 5: Cross-sections through apical (A, C, E) and basal (B, D, F) stem segments of *Utricularia macrorhiza*. For stainings and legends, refer to Fig. 4.

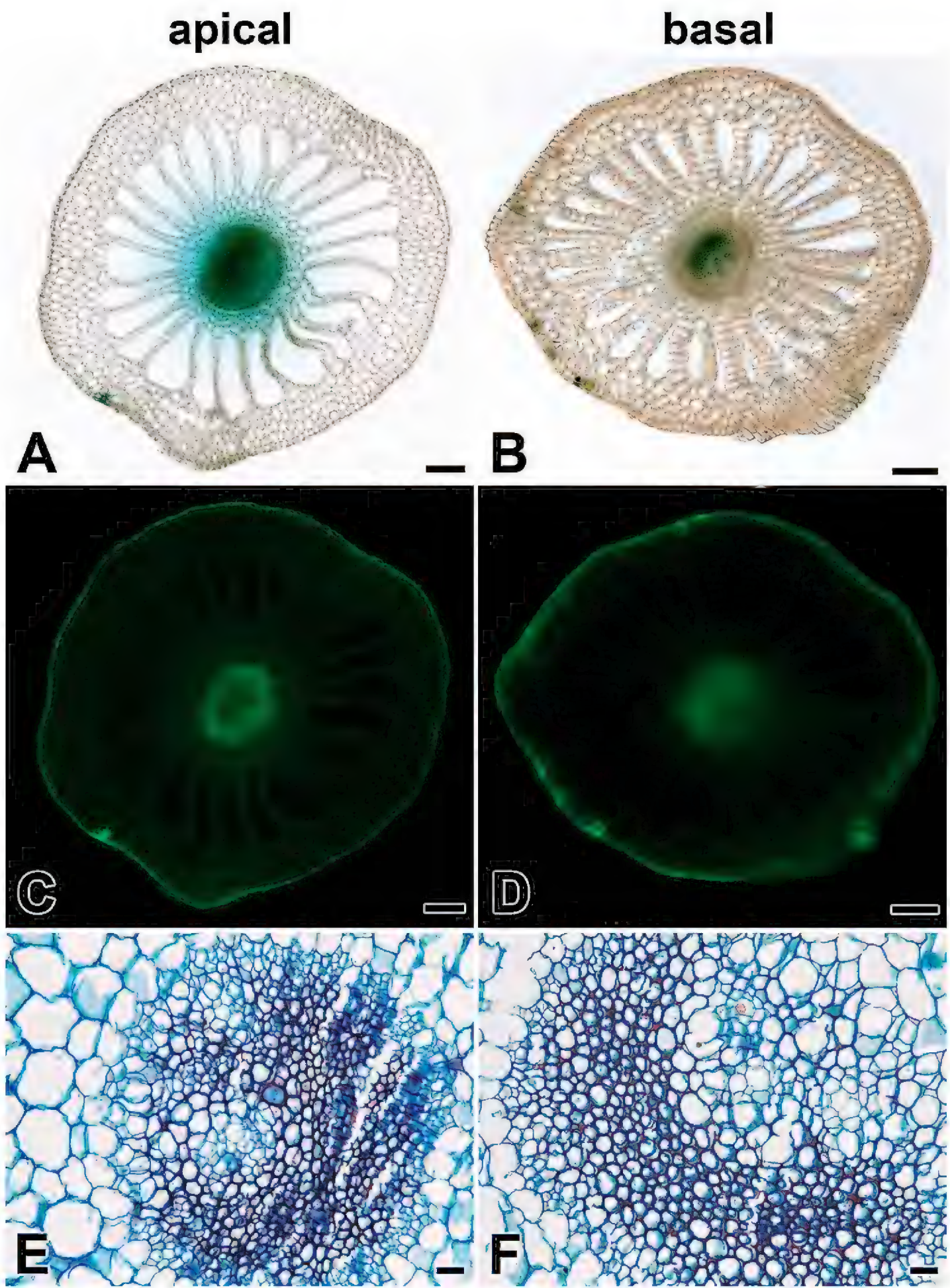


Figure 6: Cross-sections through apical (A, C, E) and basal (B, D, F) stem segments of *Utricularia vulgaris*. For stainings and legends, refer to Fig. 4.

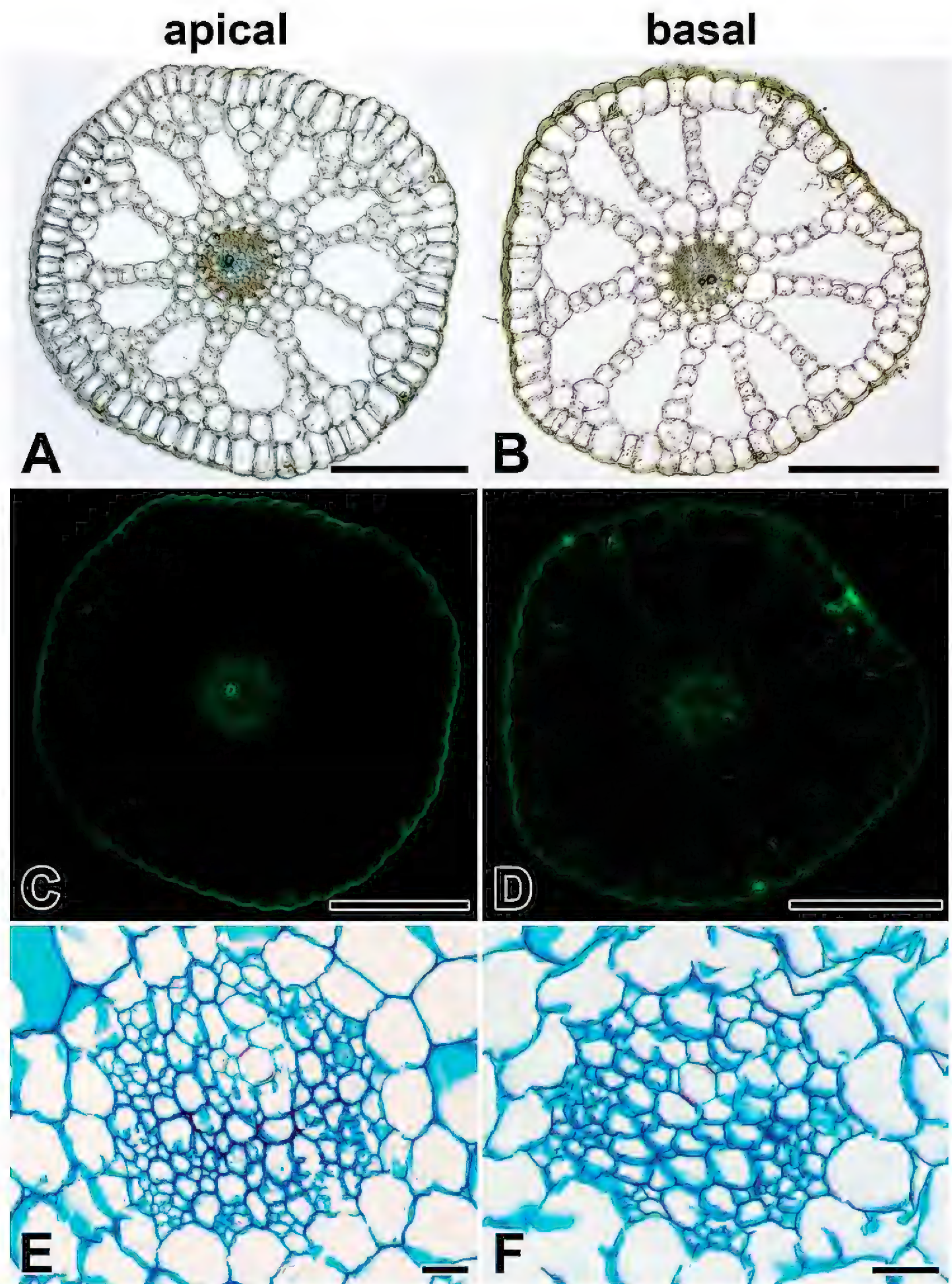


Figure 7: Cross-sections through apical (A, C, E) and basal (B, D, F) stem segments of *Utricularia stygia*. For stainings and legends, refer to Fig. 4.

Sulborska *et al.* 2020). In the apical stem segments fixed in 70% ethanol for ca. 15 months, the intensity of the brown coloration of the central cylinder (Fig. 3) was not changed, and the brown substances were not solubilized or washed out. Presumably, these substances are polyphenols. In contrast, mature *U. stygia* turions usually dehisce from mother stems and their stems do not drag them to the bottom. Moreover, they usually grow in very shallow waters. Their apical stem segments have a very thin central cylinder without lignification or polyphenol substances (Fig. 7). Moreover, the anatomical stem adaptation was not observed in other Central European aquatic carnivorous plant species, which more or less dehisce their maturing turions from mother stems (*Aldrovanda vesiculosa*, *U. bremii*, *U. minor*, *U. intermedia*, *U. ochroleuca*; L. Adamec, unpubl. observ.).

Following Schweingruber *et al.* (2020), in summer stems of three out of four species used here, the xylem and phloem within the central cylinder are difficult to distinguish and have a small proportion, as typical for rootless aquatic species. In three robust *Utricularia* species in the present study, the central cylinder of apical stem segments with mature turions probably has non-functional vascular bundles as these are impregnated by phenolic substances. By the next spring, the brown central cylinders of apical stem segments decompose and release turions that rise to the surface. However, it is interesting that the described anatomical adaptation of apical stem segments in three robust aquatic *Utricularia* species occurs only in larger turions: stems bearing turions as small as 2–4 mm usually do not form the adaptation, and these mature turions are detached from the dying mother shoots as early as in the autumn (L. Adamec, unpubl. observ.). The ecological purpose might be that the smallest turions of all *Utricularia* species have the highest probability of being attached to water birds' feathers and transported to another potential aquatic site than large turions. On the other hand, the small, free-floating turions are also more subject to being grazed by water birds and embedded in ice. However, it is not known what the mortality of free-floating *Utricularia* turions is over the winter period, but considerable frost resistance of all turions has been observed (Adamec 2018).

In conclusion, our research reveals that maturing large turions of three robust *Utricularia* species are firmly attached to senescent mother stems due to an anatomical adaptation of the central cylinder. Polyphenolic substances mainly impregnate the central cylinder in apical stem segments, thus preventing rapid decomposition of the stem at the bottom. Species that dehisce their turions from dying mother stems do not exhibit the adaptation.

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UTRICULARIA AUSTRALIS R. BR. (LENTIBULARIACEAE):
AN ADDITION TO THE CARNIVOROUS PLANTS IN FLORA OF GUJARAT, INDIA

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Abstract: *Utricularia australis* R. Br. (Lentibulariaceae), a carnivorous aquatic plant species is reported as new to Gujarat from India. Details of its identification, description, distribution, and a detailed photo plate of the plant is provided.

Introduction

The members of the Lentibulariaceae are carnivorous herbs that is placed in the order *Lamiales* (Judd *et al.* 2007). The Lentibulariaceae family consists of ca. 360 species of carnivorous plants with worldwide distribution (Fleischmann & Roccia 2018). *Utricularia* L. is the largest genus of the family Lentibulariaceae and also one of the most widely distributed. These rootless carnivorous plants, commonly known as bladderworts, have been reported on all continents except Antarctica and they occupy aquatic, terrestrial, and epiphytic habitats (Taylor 1989; Król *et al.* 2012).

In his monograph, Taylor (1989) recognized a total of 214 species in *Utricularia* worldwide species while Fleischmann (2012) reported 228 species in the world. Currently, the genus *Utricularia* is represented about 274 species (Fleischmann 2015; Delprete 2014; Kumar *et al.* 2018; Hong *et al.* 2022). Janarthanam and Henry (1992), in their taxonomic revision, reported 35 species in India. Since then, six more species were described from India (Yadav *et al.* 2000, 2005; Kumar *et al.* 2018; Sindhu *et al.* 2020., Biju *et al.* 2020).

In Gujarat, eight species (*U. arcuata* Wt., *U. aurea* Lour., *U. caerulea* L., *U. gibba* subsp. *exoleta* (R.Br.) P.Taylor, *U. janarthanamii*, *U. reticulata* Sm., *U. stellaris* L.f., *U. striatula* Sm.) are reported. (Shah 1978; Raghavan *et al.* 1981; Gadhvi *et al.* 2021).

Materials and methods

During a floristic exploration of the wetlands in Panchmahals district, Gujarat, the first author collected specimens of a species of *Utricularia* in April 2023 from Kaliakuva Pond, Panchmahals district of Gujarat, India. In April 2024, the authors expanded their search and collected additional *Utricularia* specimens from two other sites within the same district.

Results

The specimens collected exhibited distinct morphological features that set them apart from other known *Utricularia* species in the Gujarat. After critical examination and going through literature on the genus *Utricularia* (Subramanyam 1979; Taylor 1989; Janarthanam & Henry 1992; Crow 1992), herbarium specimens and opinions of experts the identity of the specimens was determined as *Utricularia australis*. In India, the species is recorded from Jammu & Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh, Madhya Pradesh, Rajasthan, Maharashtra, Karnataka, Andhra Pradesh and Odisha (Kullayiswamy *et al.* 2013; Mishra *et al.* 2021).

However, in Gujarat, *Utricularia australis* is not reported previously (Bhatt 1975; Shah 1978; Raghavan *et al.* 1981). Hence, it is a new report for the flora of Gujarat State. The voucher specimens (PKP 00745; PKP & CGP 00074; CGP & PKP 00034) are deposited in CAL and Department of Botany, SPT Arts and Science College, Godhra, Gujarat, India. A detailed taxonomic description, photographs and relevant notes on habitat, phenology, and distribution of the species are provided to facilitate its easy identification in the field.

Taxonomic treatment

Utricularia australis R. Br., Prodr. 430 (1810); Saxena in Indian Forester 96: 249 (1970); Gandhi in Saldanha & Nicolson, Fl. Hassan 563 (1976); Taylor in Steenis, Fl. Males. I.8; 299 (1977) & in Kew Bull. Add. Ser. 14: 598. f. 184 (1989); Srivastava in J. Econ. Tax. Bot. 4: 188 (1983); Pandaey *et al.* in J. Econ. Tax. Bot. 5: 865 (1984); Bennet, Namechang Fl. PI. Ind. 580 (1987); Janarthanam and Henry in Bladder worts of India 1992. *U. flexuosa* Sensus Clarke in Hook. f., Fl. Brit. India, Syn. *U. australis* R. Br., non Vahl 1804. (Fig. 1)

Description: Aquatic submerged herb, Rhizoids usually absent, stolons up to 30 cm. long, 0.5mm. thick, filiform, terete, green to greenish-yellow. Foliar organs equivalent to Leaves, Foliar organs up to 2.6 cm long, primary segment dichotomously divided, ultimate segments setulose. Bladders or Traps on nodes and foliar segments, 1-2 mm. long, obliquely obovoid, stalked; mouth lateral oblique; appendages 2, simple or branched. often setae present on lips. Inflorescence raceme, erect, emergent above water, 12-16 cm long, up to 10 flowers; flowers at regular intervals; scales 2-3 × 1.2-2.5 mm long, ovate to suborbicular, basifixed, base auriculate, apex acute to obtuse; bracts 3-3.2 × 3-3.2 mm, basifixed, ovate to suborbicular, cordate at base, acute to obtuse at apex; flowers up to 12 mm long; Pedicels 2-3 cm long, glabrous, filiform. Calyx lobes 2, slightly unequal, ovate to oblong, upper lobe 2.0-2.5 × 1.5-1.8 mm, lower lobe 1.5-2 × 1.5-2 mm, obtuse at apex. Corolla ca 11 mm long; yellow with reddish brown lines and spots on the darker lower lip; upper lip ca 5 × 3.5 mm, ovate to oblong, truncate at apex; lower lip ca 6 × 12 mm, transversely elliptic, auricled and prominently gibbous at base, truncate at apex. Spur ca 5 mm long, conical, obtuse at apex, glandular within. Stamens 2, 1-1.5 mm long; filaments dilated near anthers; sterile 1.5-1.8 mm. Ovary ca 1.2 mm long, globose, glandular; style short; stigma 2 lipped, unequal, lower lip deltoid, upper lip obovate, thin and transparent.

Phenology: Flowering occurs from April to September.

Habitat: In still waters, ponds, and lakes.

Distribution: Western Europe to China and Japan, tropical and South Africa, Sri Lanka, India to southeast Australia; in India Jammu & Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh, Madhya Pradesh, Rajasthan, Maharashtra, Karnataka, Andhra Pradesh, Odisha and Gujarat (Present study).

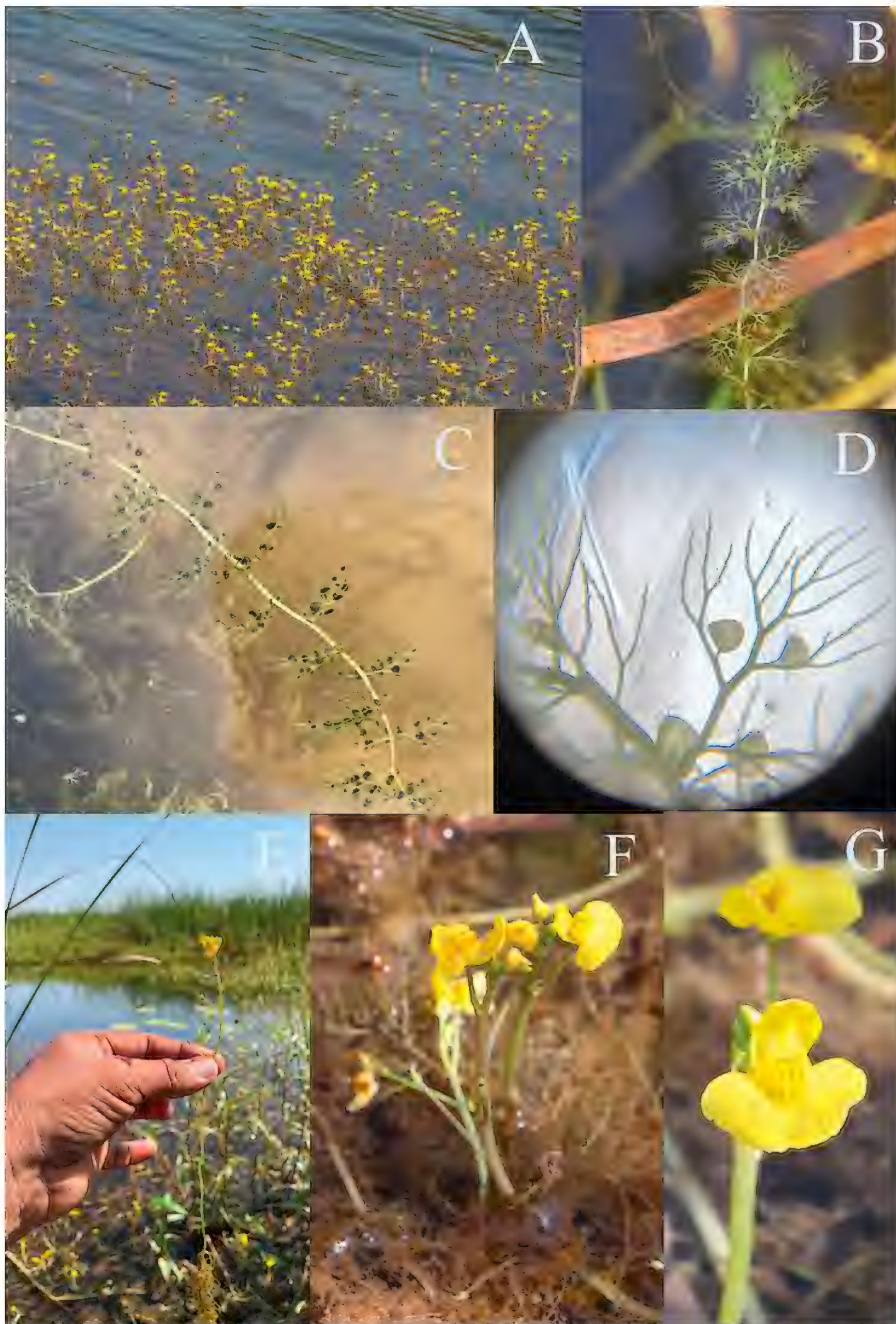


Figure 1: *Utricularia australis* R. Br. (A) Habitat, (B-C) Habit, (D) Foliar organ with traps, (E) Habit with inflorescence, (F) Inflorescences, (G) Flower. Photographs by P. K. Patel.

Specimens examined: INDIA, Gujarat, Panchmahals district, Kaliyakuva, 23°44.794'N, 73°43.334'E, 164 m, 11.04.2023, PKP00745; Navagam, 23°36.231'N, 73°37.730'E, 110 m, 19.04.2024, PKP & CGP 00074; Hirapur, 22°24.452'N, 73°43.211'E, 125 m, 24.04.2024, CGP & PKP 00034; (Department of Botany Herbarium, SPT Arts & Science College, Godhra, Gujarat).

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UTRICULARIA PURPUREA (PURPLE BLADDERWORT) OCCASIONALLY WEEDY IN NORTHERN WISCONSIN

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Abstract: *Utricularia purpurea* (Purple Bladderwort) has had sporadic population explosions in some northern Wisconsin lakes within the last 20 years. It can form dense floating, nonflowering masses that impede recreational activities on the affected lakes. Three lakes in which this weediness was noted are soft water, low-nutrient, seepage lakes that experience widely fluctuating water levels and recent nutrient runoff. Excessive weediness has not been described in nearby Minnesota nor Michigan, although the plant is sporadically locally abundant. *U. purpurea* is listed as “Endangered” in Minnesota.

Utricularia purpurea is a rootless, aquatic, carnivorous plant. It has a wide range within eastern North America, extending along the coast from eastern Texas into Canada. The northern part of its range extends west from the northeastern United States and eastern Canadian provinces into Minnesota and Ontario. In the Great Lakes region, *U. purpurea* occurs in soft, quiet water, shallow to more than three meters deep (Black & Judziewicz 2009).

Utricularia purpurea is a native plant which has extended its range into Wisconsin within the last 100 years. Within the last 20 years, it has become a sporadic nuisance in several northern Wisconsin lakes. A 20 June 2014, Northwoods Star Journal article described *U. purpurea* outbreaks at Flannery and Velvet Lakes, and a third unnamed lake near Rhinelander, Wisconsin (Anon 2014). Floating masses of the plant were so dense that it tangled boat propellers. Lake goers could not swim in it nor fish through it. According to the article, large populations of *U. purpurea* reside on the lake bottoms then float up, typically beginning in mid-July, to form dense surface masses. The article reported that the plants die on the lake bottom or shortly after reaching the surface. Sporadic dense populations were also noted in nearby Frog and Shallow Lakes. These later populations grow amidst other aquatic vegetation and will flower, whereas the dense masses that occur at Flannery and Velvet Lakes typically do not flower (Susan Knight, pers. comm. 2024).

The first University of Wisconsin-Madison herbarium collection record for *U. purpurea* was in 1931. The plant was listed as “Special Concern” in Wisconsin in 1986 (Kevin Doyle, pers. comm. 2024). It was delisted in 2011 when later surveys found enough new populations and enough large populations to confirm that the species had a secure foothold in the state. Doyle was unaware of the weedy outbreaks of *U. purpurea* in the three Wisconsin lakes featured in the 2014 Northwoods Star Journal article. When informed of these outbreaks, Doyle recalled an increase in the number of aquatic plant surveys in Wisconsin starting around 2005, and an increase in the number of reports of new *U. purpurea* populations (Kevin Doyle pers. comm. 2024).

The *U. purpurea* populations at Flannery and Velvet Lakes were quantified in Warm-water Point-intercept Macrophyte Surveys conducted in 2012, 2017, and 2022. The three years of data are discussed and compared in the 2022 reports (Berg 2022a, b). The behavior of *U. purpurea* as



Figure 1: Floating mass of *Utricularia purpurea* with *Brasenia schreberi*, 30 July 2022, Flannery Lake, Oneida County, Wisconsin. Photo by Matthew Berg.

described in the lakes featured in the Northwoods Star Journal article is interesting but in partial error. At Flannery and Velvet Lakes, *U. purpurea* can indeed form dense floating masses (Figs. 1-3). However, according to Berg, the plants do not die in summer (Matthew Berg, pers. comm. 2024). The *U. purpurea* masses are often covered with sediment and other debris which can make them appear unhealthy or dead, but they do not actually die until autumn.

Berg notes that in Wisconsin he finds *U. purpurea* in tannic-stained, soft water lakes with low nutrient levels, especially in lakes with bogs. He has never seen it in eutrophic systems with high nutrient or algal loads. Berg has also seen *U. purpurea* growing in weedy masses at Kirby Lake in Barron County, Wisconsin. He notes that Flannery, Velvet, and Kirby Lakes are all seepage lakes that experience widely fluctuating water levels related to drought, rain events, and snow melt (Matthew Berg, pers. comm. 2024). Paul Skawinski notes *U. purpurea* outbreaks are also associated with development where nutrients are likely being added through runoff, fertilizers, septic systems, and the like (Paul Skawinski, pers. comm. 2024).

Paul Skawinski notes that *U. purpurea* is pollinated by terrestrial insects and growing conditions must allow the plant to get its flowering stalk above the water surface and maintain it there. He notes that *U. purpurea* tends to flower when growing among water lilies or other vegetation that provides extra support for the flowering stalks and some buffering against wave energy (Figs. 4, 5).



Figure 2: *Utricularia purpurea* surrounding a dock on Flannery Lake, 30 July 2022. Photo by Matthew Berg.



Figure 3: Underwater view of *Utricularia purpurea* floating mass at Velvet Lake, Oneida County, Wisconsin, 2017. Photo by Brian M. Collins.

Skawinski also notes that the dense weedy masses of *U. purpurea* typically do not flower (Paul Skawinski, pers. comm. 2024). Donna Perleberg has observed *U. purpurea* to have “boom and bust” years; large population swings year to year may be a natural cycle of this species (Donna Perleberg, pers. comm. 2024).

The earliest collection of *U. purpurea* at the University of Minnesota herbarium is 1992. In Minnesota, it was listed as “Special Concern” in 1996 and the designation strengthened to “Endangered” in 2013. There have been over 2,000 targeted botanical surveys of the lakes statewide and *U. purpurea* was found in only 20 locations. The documented occurrences of *U. purpurea* remain low despite high survey efforts (Courtney Schirmers, pers. comm. 2024). While *U. purpurea* can occasionally grow abundantly within a water body or portion of a water body, it is listed as “Endangered” in Minnesota due in part to its limited distribution (Donna Perleberg, pers. comm. 2024).

The earliest collection of *U. purpurea* at the Michigan State University herbarium is 1892. While *U. purpurea* can also be locally abundant in some years, the plant has not been observed to form dense, floating, nonflowering masses as it does in Wisconsin. (Tom Alwin, pers. comm. 2024).

In conclusion, *U. purpurea* has been observed to occasionally form dense, weedy masses in some northern Wisconsin lakes. This phenomenon had not been noted by state biologists in Wisconsin nor in nearby Minnesota or Michigan. Attention was drawn to this phenomenon in northern Wisconsin when it negatively affected lake residents’ recreational activities. This may be a rare event most



Figure 4: *Utricularia purpurea* flowering among *Nymphaea odorata* in Frog Lake, Iron County, Wisconsin. Photo by Susan Knight.



Figure 5: Non-blooming dense, normal clump of *Utricularia purpurea*. Photo by Paul Skawinski.

likely to sporadically occur in soft water, low-nutrient, seepage lakes that experience widely fluctuating water levels and recent nutrient additions in runoff.

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NEW CULTIVARS

Keywords: cultivar, *Cephalotus follicularis* ‘Thumbelina’, *Drosera* ‘Red Starburst’, *Nepenthes* ‘Chonk’

<https://doi.org/10.55360/cpn533.cv533>

Abstract: Three new carnivorous plant cultivars are named and described: *Cephalotus follicularis* ‘Thumbelina’, *Drosera* ‘Red Starburst’, and *Nepenthes* ‘Chonk’.

Cephalotus follicularis ‘Thumbelina’

Submitted: 15 May 2024

During the winter of 2019, I purchased with great anticipation several location *Cephalotus follicularis* plants from the late CP Australian nurseryman, Allen Lowrie. Though he normally sold *Cephalotus* in sets of four plants per location, he'd kindly agreed to send a plant from four different locations for the same price. Topping this generosity, he included an unusual bonus clone from Northcliffe, WA that produced tiny adult pitchers the likes of which I'd never seen in my 25+ years growing *Cephalotus*.

The most striking features of this clone are its tiny pitchers and small overall size. Individual plants can average up to 3.5 cm in diameter (Fig. 1A) with pitchers 2.0 cm in height and 1.0 cm wide (Fig. 1B). Non-carnivorous leaves are also proportionally tiny. In addition, plants develop a darker coloration than most of my other *Cephalotus* clones under led lamps, particularly the interior lid and peristome, which can turn completely black. Having cultivated this clone for over 5 years, I have observed that these features are stable and uniform at all stages of growth. Mature plants derived from leaf pullings or rhizome divisions have also retained these unique features. Pitchers and the overall size of *C.* ‘Thumbelina’ are consistently much smaller than other small-pitchering clones in my collection, such as *C.* ‘Squat’ (Fig. 2). To my knowledge, it is the smallest *Cephalotus* clone in cultivation. Its diminutive stature and intense coloration may have developed as an adaptive response to the harsh, open, pure sand growing conditions of its native Northcliffe habitat (Nunn 2014).

Cephalotus ‘Thumbelina’ was coined from the Hans Christian Andersen fairytale about a tiny, beautiful maiden and her improbable journey of courage and survival through nature. As she was barely half as long as a thumb and slept in a walnut-shell cradle, they called her “Thumbelina”. It is a fitting name for this diminutive yet colorful *Cephalotus* with the evolutionary spunk to survive in the harsh, nutrient poor sands of its native Western Australian wetlands.

To keep the cultivar's characteristics, *Cephalotus* ‘Thumbelina’ must be propagated by vegetative means only.

Reference

Nunn, R. 2014. *Cephalotus follicularis* cultivars and forms in cultivation – is there a basis for the current naming protocols? Carniv. Pl. Newslett. 43(1): 14-18. <https://doi.org/10.55360/cpn431.rn450>

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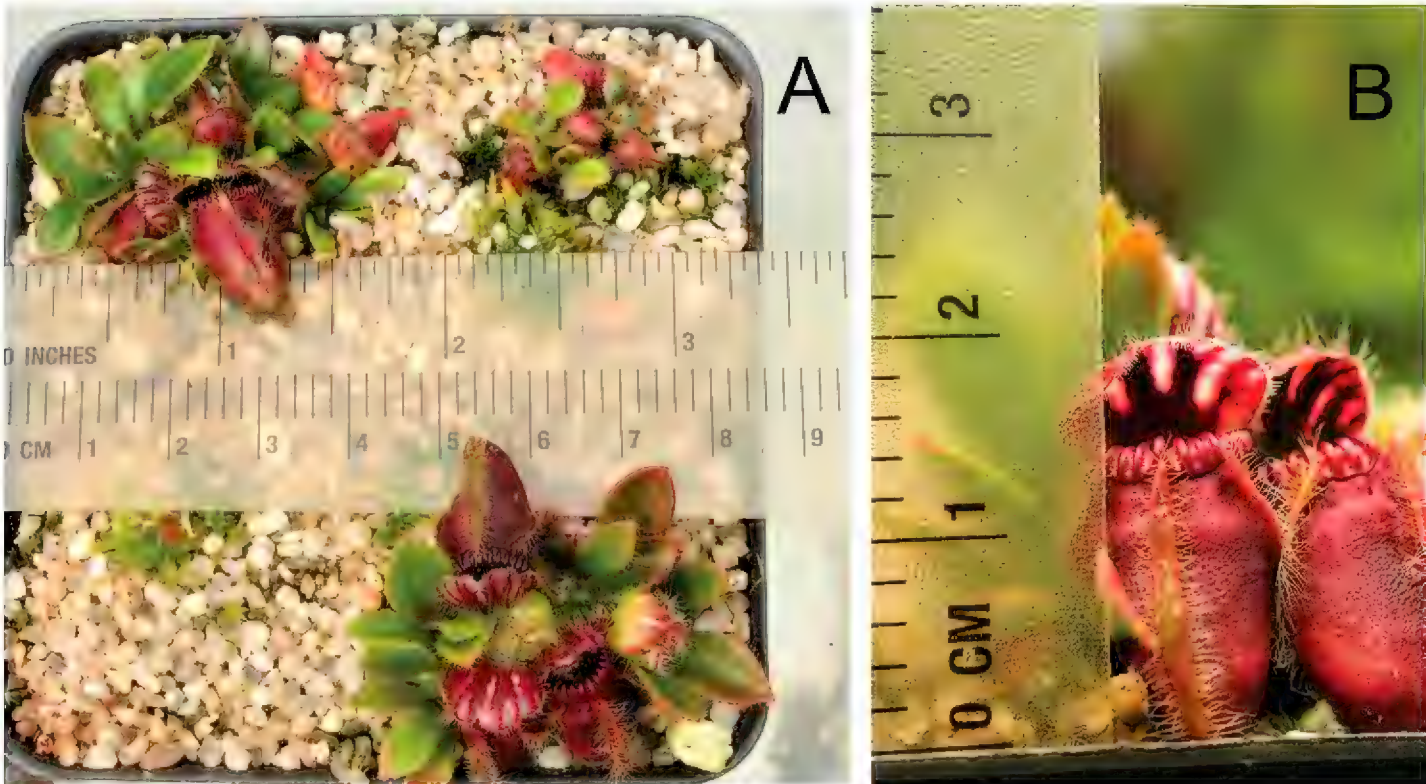


Figure 1: *Cephalotus follicularis* 'Thumbelina' (A) overall size and appearance; (B) pitcher size.



Figure 2: Size comparison between *Cephalotus* 'Squat' (left) and *C. 'Thumbelina'* (right).

Drosera ‘Red Starburst’

Submitted: 26 April 2024

Drosera ‘Red Starburst’ is a horticulturally produced cultivar germinated in November of 2022 between *Drosera* aff. *lanata* (Flying Fox Creek) × *petiolaris*. Out of 46 plants produced from the cross, this phenotype carries the characteristics of both parent plants in equal proportion while growing more vigorously and larger than the parents. At maturity the rosette is around 12 cm across. Notably, it has much less dense dendritic hairs than *Drosera* aff. *lanata* while retaining the deep red pad coloration that has a lime green interior near the rosette at maturity. The pads are larger than both the parent plants and hold more mucilage than either parent.

This phenotype also grows more similar to *Drosera petiolaris* as it holds foliage upright above the ground instead of lying flat like *Drosera* aff. *lanata*. After 3 months of propagation via leaf pullings the resulting clones darken from light green to a deep red, similar to the wrappers of red Starburst candy which is the namesake. At maturity this phenotype retains the neon green coloration near the rosette seen in *Drosera* aff. *lanata* that shifts to the dark red towards the pads. This is in steep contrast to all the other plants I’ve observed in my conditions that either retain the green leaves of *Drosera petiolaris* or the dense dendritic hairs of *Drosera* aff. *lanata*.

This particular cultivar is also notable for being the fastest cloning woolly sundews (*Drosera* section *Lasiocephala*) from leaf pullings in my conditions, often striking within 3-4 weeks of pulling as opposed to the 10-18 weeks I’ve observed in other woolly sundew species and hybrids. Clones of this plant take around 8-12 months to reach maturity and continue to grow in size. Figure 3 shows the plant at maturity, clones at 3 months of age, and clones at 6 months of age demonstrate the rapid shifts in coloration as the plant ages. Notably the clones start with a coloration similar to *Drosera petiolaris* of a dark green, shifting over a few months to the red of *Drosera* aff. *lanata*, then finally at maturity a gradient of lime green to red from the rosette towards the pads.

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Figure 3: *Drosera* ‘Red Starburst’: (A) mature sized, (B) clones at 3 months of age, (C) clones at 6 months of age.

Submitted: 31 May 2024

Nepenthes ‘Chonk’ is a hybrid of *Nepenthes* (*ventricosa* × *sibuyanensis*) × *Nepenthes sanguinea* that was bred by Exotica Plants in Queensland, Australia, and acquired as a seed grown individual in November 2020. *Nepenthes* ‘Chonk’ is particularly distinctive by the large overall size of the traps, distinctive narrowing in the center of the wings, and compression of the pitcher body expressed in upper pitchers.

The traps of *Nepenthes* ‘Chonk’ maintain consistent coloration between upper and lower pitchers and the shade does not significantly shift throughout the life of the trap. The body of the pitcher has muted greens and yellows so pale as to appear almost white. The peristome is a vivid red with a moderate degree of scalloping on the outer perimeter. The traps have distinctive wings that are narrowest at the midpoint and wider at the operculum and base of the trap. The shape of the body of the traps and the change in shape between lower and upper pitchers are additional distinctive features. Lower traps (Fig. 4) possess a cylindrical shape in cross section when compared to the upper traps. Upper traps exhibit a distinct flattening (Fig. 5) resulting in a reduced depth to the body of the trap. This feature produces upper traps that appear almost rectangular which served as the inspiration for the name Chonk. Lower traps rarely exceed 10.2 cm in height before transitioning to upper pitchers. Upper traps regularly attain heights of 26.7 cm with a peristome opening of 11.5 cm although larger sizes are expected as this plant matures.

The name “Chonk” was selected for its slang meaning of a large or solid object often used to refer to abnormally large or fat animals

To maintain its unique features, *Nepenthes* ‘Chonk’ must be reproduced vegetatively only.

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Figure 4: *Nepenthes* ‘Chonk’ lower pitchers.



Figure 5: *Nepenthes* 'Chonk' upper pitchers.

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CULTIVAR NAMES REGISTERED IN 2022 AND 2023

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Keywords: registered, cultivar names, 2022, 2023

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Name	Description	Date
<i>Cephalotus</i> ‘Tom Thumb’ C. Leach	Carniv. Pl. Newslett. 50: 230 (2021)	23. 01. 22
<i>Darlingtonia</i> ‘Iago’ M. Del Buono	Carniv. Pl. Newslett. 51: 155 (2022)	30. 12. 22
<i>Dionaea</i> ‘Carboni Ardenti’ G. Mehle	Carniv. Pl. Newslett. 50: 224 (2021)	23. 01. 22
<i>Dionaea</i> ‘CCCP Orca’ C. Heath	Carniv. Pl. Newslett. 51: 110 (2022)	29. 08. 22
<i>Dionaea</i> ‘CCCP Sea Scallop’ C. Heath & E. Wang	Carniv. Pl. Newslett. 51: 78 (2022)	10. 06. 22
<i>Dionaea</i> ‘EGAC Smurf’ A. R. Caldas Enriquez	Carniv. Pl. Newslett. 51: 160 (2022)	30. 12. 22
<i>Dionaea</i> ‘F. S. Anemone’ J. C. Páez Jiménez	Carniv. Pl. Newslett. 50: 227 (2021)	23. 01. 22
<i>Dionaea</i> ‘F. S. Colombian Dwarf Caiman’ J. C. Páez Jiménez & M. Bohórquez Rodríguez	Carniv. Pl. Newslett. 50: 226 (2021)	23. 01. 22
<i>Dionaea</i> ‘Periscope’ G. Mehle	Carniv. Pl. Newslett. 50: 225 (2021)	23. 01. 22
<i>Dionaea</i> ‘PFT Carcharoth’ M. Howlett	Carniv. Pl. Newslett. 51: 159 (2022)	30. 12. 22
<i>Dionaea</i> ‘Schup Destruction’ G. Mehle	Carniv. Pl. Newslett. 51: 109 (2022)	29. 08. 22
<i>Nepenthes</i> ‘Black Rainbow’ S. Nuanlaong	Carniv. Pl. Newslett. 51: 154 (2022)	30. 12. 22
<i>Nepenthes</i> ‘Candy Apple’ A. Fox	Carniv. Pl. Newslett. 50: 228 (2021)	23. 01. 22
<i>Pinguicula</i> ‘Bailly’ S. Lavayssière	Dionée 20: 6 (1990)	09. 07. 22
<i>Pinguicula</i> ‘Faulisi’ H. Bramble	Carniv. Pl. Newslett. 51: 156 (2022)	30. 12. 22
<i>Sarracenia</i> ‘Chaos’ R. Co	Carniv. Pl. Newslett. 51: 115 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Crown of Thorns’ R. Co	Carniv. Pl. Newslett. 51: 116 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Defiance’ R. Co	Carniv. Pl. Newslett. 51: 117 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Dragon Queen’ J. Lynch	Carniv. Pl. Newslett. 51: 114 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Joker’ G. Alcock	Carniv. Pl. Newslett. 50: 229 (2021)	23. 01. 22
<i>Sarracenia</i> ‘Lion’s Mane’ R. Co	Carniv. Pl. Newslett. 51: 118 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Mediterranean Sunrise’ D. Righetti	Carniv. Pl. Newslett. 51: 122 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Mocha Dick’ G. Bergamo	Carniv. Pl. Newslett. 51: 79 (2022)	10. 06. 22
<i>Sarracenia</i> ‘Paradox’ R. Co	Carniv. Pl. Newslett. 51: 119 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Pink Champagne’ R. Co	Carniv. Pl. Newslett. 51: 120 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Prof. Goetghebeur’ D. Blancquaert	Carniv. Pl. Newslett. 51: 77 (2022)	10. 06. 22
<i>Sarracenia</i> ‘Ring of Fire’ F. Obregon	Carniv. Pl. Newslett. 51: 113 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Sally Gipple’ F. Obregon	Carniv. Pl. Newslett. 51: 112 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Templar Cross’ P. Falchi	Carniv. Pl. Newslett. 51: 157 (2022)	30. 12. 22
<i>Sarracenia</i> ‘Thelma’s Lantern’ R. Co	Carniv. Pl. Newslett. 51: 121 (2022)	29. 08. 22
<i>Sarracenia</i> ‘Valkyrie’ L. Eggen	Carniv. Pl. Newslett. 51: 158 (2022)	30. 12. 22
<i>Sarracenia</i> ‘White Beast’ M. Geurts	Carniv. Pl. Newslett. 50: 231 (2021)	23. 01. 22
<i>Sarracenia</i> ‘Wilkerson’s Red Rocket’ K. Simpson	Carniv. Pl. Newslett. 51: 111 (2022)	29. 08. 22

Name	Description	Date
<i>Dionaea</i> ‘Angioma’ J. Müller	Carniv. Pl. Newslett. 52: 111 (2023)	26. 08. 23
<i>Dionaea</i> ‘EEC Skyscraper’ E. & E. Wang	Carniv. Pl. Newslett. 51: 208 (2022)	23. 01. 23
<i>Dionaea</i> ‘EEC Thresher Shark’ E. & E. Wang	Carniv. Pl. Newslett. 52: 112 (2023)	26. 08. 23
<i>Dionaea</i> ‘F. S. Loony Clam’ J. C. Páez Jiménez & M. Bohórquez Rodríguez	Carniv. Pl. Newslett. 51: 209 (2022)	23. 01. 23
<i>Pinguicula</i> ‘Baena White Leaves’ S. M. Hinojosa	Carniv. Pl. Newslett. 52: 170 (2023)	29. 12. 23
<i>Pinguicula</i> ‘Coquette’ M. Rubnitz	Carniv. Pl. Newslett. 52: 167 (2023)	29. 12. 23
<i>Pinguicula</i> ‘Damon’s Choice’ M. Rubnitz	Carniv. Pl. Newslett. 52: 114 (2023)	26. 08. 23
<i>Pinguicula</i> ‘PE Formosa’ Y. -F. Ho	Carniv. Pl. Newslett. 51: 210 (2022)	23. 01. 23
<i>Pinguicula</i> ‘Red Lotus’ M. S. Anderson	Carniv. Pl. Newslett. 52: 169 (2023)	29. 12. 23
<i>Pinguicula</i> ‘Sunnyside’ M. Rubnitz	Carniv. Pl. Newslett. 52: 168 (2023)	29. 12. 23
<i>Pinguicula</i> ‘Urchin’ M. Rubnitz	Carniv. Pl. Newslett. 52: 113 (2023)	26. 08. 23
<i>Sarracenia</i> ‘Alien Banana’ N. Romanowski	Gardening with Carnivores: 93 (2002)	28. 12. 23
<i>Sarracenia</i> ‘Arctique’ O. Bres	Carniv. Pl. Newslett. 52: 60 (2023)	29. 04. 23
<i>Sarracenia</i> ‘Asmoderolle’ M. Philippe	Carniv. Pl. Newslett. 52: 122 (2023)	26. 08. 23
<i>Sarracenia</i> ‘Bloody Rose’ Z. Qiu	Carniv. Pl. Newslett. 52: 171 (2023)	29. 12. 23
<i>Sarracenia</i> ‘Broad Lid’ N. Romanowski	Gardening with Carnivores: 77 (2002)	28. 12. 23
<i>Sarracenia</i> ‘Camisole’ M. R. Sprouse	Carniv. Pl. Newslett. 52: 118 (2023)	26. 08. 23
<i>Sarracenia</i> ‘Carolina Caramel’ F. Vosse	Carniv. Pl. Newslett. 52: 59 (2023)	29. 04. 23
<i>Sarracenia</i> ‘Clafoutis’ O. Bres	Carniv. Pl. Newslett. 52: 61 (2023)	29. 04. 23
<i>Sarracenia</i> ‘Crimson Snow’ N. Romanowski	Water Gard. Pl. & Anim.: 64 (2000)	28. 12. 23
<i>Sarracenia</i> ‘Firemouth’ N. Romanowski	Gardening with Carnivores: 82 (2002)	28. 12. 23
<i>Sarracenia</i> ‘Flair’ N. Romanowski	Gardening with Carnivores: 89 (2002)	28. 12. 23
<i>Sarracenia</i> ‘Flamenco’ F. Vosse	Carniv. Pl. Newslett. 52: 121 (2023)	26. 08. 23
<i>Sarracenia</i> ‘Fledgling’ N. Romanowski	Gardening with Carnivores: 95 (2002)	28. 12. 23
<i>Sarracenia</i> ‘GraceY’ A. Weng	Carniv. Pl. Newslett. 52: 115 (2023)	26. 08. 23
<i>Sarracenia</i> ‘Night Sky’ N. Romanowski	Gardening with Carnivores: 89 (2002)	28. 12. 23
<i>Sarracenia</i> ‘Patchwork’ O. Bres	Carniv. Pl. Newslett. 52: 62 (2023)	29. 04. 23
<i>Sarracenia</i> ‘Patty Petzel’ R. D. Duncan	Carniv. Pl. Newslett. 52: 63 (2023)	29. 04. 23
<i>Sarracenia</i> ‘Pink Windows’ N. Romanowski	Gardening with Carnivores: 77 (2002)	28. 12. 23
<i>Sarracenia</i> ‘Purple Devil’ M. Philippe	Carniv. Pl. Newslett. 51: 207 (2022)	23. 01. 23
<i>Sarracenia</i> ‘Purple Throat’ N. Romanowski	Water Gard. Pl. & Anim.: 63 (2000)	28. 12. 23
<i>Sarracenia</i> ‘Red Throat’ N. Romanowski	Gardening with Carnivores: 65 (2002)	28. 12. 23
<i>Sarracenia</i> ‘Red-flowered Ghost’ N. Romanowski	Water Gard. Pl. & Anim.: 64 (2000)	28. 12. 23
<i>Sarracenia</i> ‘Ritter’s Pet’ N. Romanowski	Gardening with Carnivores: 86 (2002)	28. 12. 23
<i>Sarracenia</i> ‘Skywatcher’ N. Romanowski	Gardening with Carnivores: 75 (2002)	28. 12. 23
<i>Sarracenia</i> ‘Spanish Dancer’ E. Melani	Carniv. Pl. Newslett. 52: 116 (2023)	26. 08. 23
<i>Sarracenia</i> ‘Vanilla Swirl’ N. Thomas	Carniv. Pl. Newslett. 51: 211 (2022)	23. 01. 23
<i>Sarracenia</i> ‘Velvety Red’ N. Romanowski	Water Gard. Pl. & Anim.: 64 (2000)	28. 12. 23
<i>Sarracenia</i> ‘White Cobra’ M. R. Sprouse	Carniv. Pl. Newslett. 52: 119 (2023)	26. 08. 23
<i>Sarracenia</i> ‘Wilkerson White Knight’ M. R. Sprouse	Carniv. Pl. Newslett. 52: 120 (2023)	26. 08. 23
<i>Sarracenia</i> ‘Yellow Hornet’ L. Mondoux	Carniv. Pl. Newslett. 52: 117 (2023)	26. 08. 23
<i>Utricularia</i> ‘Garcia’s Treasure’ G. Baião & B. Garcia	Carniv. Pl. Newslett. 52: 123 (2023)	26. 08. 23

